

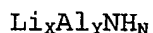
Claims

1. A multi-metal-nitrogen compound for use in hydrogen storage materials, the compound comprising at least two dissimilar metal atoms and a nitrogen atom, the multi-metal-nitrogen compound being capable of absorbing hydrogen at an absorption temperature and pressure, and of desorbing 60% or more by weight of said absorbed hydrogen at a desorption temperature and pressure.
2. A multi-metal-nitrogen compound as claimed in claim 1, wherein the compound is capable of absorbing and desorbing hydrogen at a temperature of 220°C or less.
3. A multi-metal-nitrogen compound as claimed in claim 2, wherein the absorption or desorption temperature is in the range of 0°C to 200°C.
4. A multi-metal-nitrogen compound as claimed in claim 1, wherein the compound is capable of desorbing 80% or more of the absorbed hydrogen
5. A multi-metal-nitrogen compound as claimed in claim 1, wherein the multimetal-nitrogen compound is a bimetal-nitrogen compound having two dissimilar metals selected from the group consisting of Group IA, Group IIA, Group IIIB, Group IVA and Group VIII of the Periodic Table of elements, and mixtures thereof.
6. A multi-metal-nitrogen compound as claimed in claim 1, wherein the multimetal-nitrogen compound is a

bimetal-nitrogen compound having two dissimilar metals selected from the group consisting of aluminium (Al), calcium (Ca), lithium (Li), magnesium (Mg), and sodium (Na).

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7. A multi-metal-nitrogen compound as claimed in claim 1, wherein the multimetal-nitrogen compound is a bimetal-nitrogen compound comprising a nitrogen atom and a pair of metal atoms selected from the group consisting of lithium(Li)-aluminium(Al), lithium(Li)-magnesium(Mg), lithium(Li)-calcium(Ca), magnesium(Mg)-calcium(Ca), magnesium(Mg)-sodium(Na), magnesium(Mg)-aluminium(Al), and mixtures thereof.
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8. A multi-metal-nitrogen compound as claimed in claim 1, comprising one or two hydrogen atoms bonded to the nitrogen atom.
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9. A multi-metal-nitrogen compound as claimed in claim 1, wherein one of the metal atoms is bonded to hydrogen and the other metal atom is bonded to nitrogen.
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10. A multi-metal-nitrogen compound as claimed in claim 1, comprising a lithium-aluminium-nitrogen compound selected from the group consisting of lithium-aluminium nitride, lithium-aluminium imide, lithium-aluminium amide or mixtures thereof.
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11. A multi-metal-nitrogen compound as claimed in claim 1, comprising a lithium(Li)-aluminium(Al)-nitrogen(N) compound represented by the general formula:
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where $0 < X < 3$, $0 < Y < 1$ and $N \geq |3-X-3Y|$.

12. A multi-metal-nitrogen compound as claimed in claim 1, comprising a bimetal-nitrogen compound selected from the group consisting of lithium-magnesium-nitride, lithium-magnesium-imide, lithium-magnesium-amide, lithium-calcium-nitride, lithium-calcium-imide, lithium-calcium-amide, and mixtures thereof.
13. A multi-metal-nitrogen compound as claimed in claim 1, comprising a lithium(Li)-magnesium(Mg)-nitrogen(N) compound represented by the general formula:



where $0 < X < 3$, $0 < Y < 1.5$ and $N \geq |3-X-2Y|$.

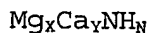
14. A multi-metal-nitrogen compound as claimed in claim 1, comprising a lithium(Li)-calcium(Ca)-nitrogen(N) compound represented by the general formula:



where $0 < X < 3$, $0 < Y < 1.5$ and $N \geq |3-X-2Y|$.

15. A multi-metal-nitrogen compound as claimed in claim 1, comprising a bimetal-nitrogen compound selected from the group consisting of magnesium-calcium nitride, magnesium-calcium imide, magnesium-calcium amide, or mixtures thereof.

16. A multi-metal-nitrogen compound as claimed in claim 1, comprising a magnesium(Mg)-calcium(Ca)-nitrogen(N) compound represented by the general formula:



where $0 < X < 1.5$, $0 < Y < 1.5$ and $N \geq |3-2x-2y|$.

17. A multi-metal-nitrogen compound as claimed in claim 1, comprising a bimetal-nitrogen compound selected from the group consisting of magnesium-sodium nitride, magnesium-sodium imide, magnesium-sodium amide, or mixtures thereof.
18. A multi-metal-nitrogen compound as claimed in claim 1, comprising a magnesium(Mg)-sodium(Na)-nitrogen(N) compound represented by the general formula:
- $$\text{Mg}_x\text{Na}_y\text{NH}_N$$
- where $0 < X < 1.5$, $0 < Y < 1.5$ and $N \geq |3 - 2x - 2y|$.
19. A multi-metal-nitrogen compound as claimed in claim 1, comprising a bimetal-nitrogen compound selected from the group consisting of magnesium-aluminium nitride, magnesium-aluminium imide, magnesium-aluminium amide, and mixtures thereof.
20. A multi-metal-nitrogen compound as claimed in claim 1, comprising a magnesium(Mg)-aluminium(Al)-nitrogen(N) compound represented by the general formula:
- $$\text{Mg}_x\text{Al}_y\text{NH}_N$$
- where $0 < X < 1.5$, $0 < Y < 1.5$ and $N \geq |3 - 2x - 2y|$.
21. A hydrogen reservoir containing a multi-metal-nitrogen compound as claimed in claim 1.
22. A process for reverse adsorbing hydrogen comprising: contacting the multi-metal-nitrogen compound of claim 1 with hydrogen at an absorption temperature and pressure; and

releasing hydrogen from the multi-metal-nitrogen compound at a desorption temperature and pressure.

23. A process for making a multi-metal-nitrogen compound
5 for use in a hydrogen reservoir, the process comprising the step of heating a metal hydride comprising at least one metal and a metal-nitrogen compound comprising at least one metal that is dissimilar to said at least one metal of said metal
10 hydride, at a temperature and a pressure to form the multi-metal-nitrogen compound, the dissimilar metals being selected such that the multi-metal-nitrogen compound is capable of absorbing hydrogen at an absorption temperature and pressure, and of
15 desorbing 60% or more by weight of said absorbed hydrogen at a desorption temperature and pressure.

24. Use of a mutli-metal-nitrogen compound as claimed in
claim 1 for storing hydrogen.

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AMENDED CLAIMS

[received by the International Bureau on 3 January 2005 (03.01.2005);
original claims 24 has been amended, remaining claims unchanged (1 page)]

releasing hydrogen from the multi-metal-nitrogen compound at a desorption temperature and pressure.

23. A process for making a multi-metal-nitrogen compound
5 for use in a hydrogen reservoir, the process comprising the step of heating a metal hydride comprising at least one metal and a metal-nitrogen compound comprising at least one metal that is dissimilar to said at least one metal of said metal
10 hydride, at a temperature and a pressure to form the multi-metal-nitrogen compound, the dissimilar metals being selected such that the multi-metal-nitrogen compound is capable of absorbing hydrogen at an absorption temperature and pressure, and of
15 desorbing 60% or more by weight of said absorbed hydrogen at a desorption temperature and pressure.
24. Use of a multi-metal-nitrogen compound as claimed in
claim 1 for storing hydrogen.

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